

REMARKS

Claims 1-2, 4-19 and 33-46 are pending in this application. These claims have been rejected as being unpatentable under 35 U.S.C. § 103 over various cited references.

The following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claims. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claims and the cited references. In addition, Applicants request that the Office carefully review any references discussed below to ensure that Applicants understanding and discussion of the references, if any, is consistent with the Office's understanding.

Rejection under 35 U.S.C. §103

Claims 1-2, 4-5, 7-12, 14-16, 18-19, 33-34, 36-38, 40-42, and 44-45 have been rejected under 35 U.S.C. § 103 as being unpatentable over Shibata (U.S. Patent No. 6,461,890) in view of U.S. Patent No. 6,223,429 to Kaneda et al. ("Kaneda"). Applicants respectfully traverse this rejection for two reasons.

1. The Office argues that Shibata teaches the invention substantially as claimed, except that Shibata fails to disclose the claim limitation that the conductive particles comprise metal with an insulating layer, as currently recited in the rejected claims. Citing column 6, lines 35+, the Office contends that Kaneda describes conductive particles that comprise metal with an insulating layer. The Office alleges that it would have been obvious to one of ordinary skill in the art to use the conductive particles of Kaneda in the invention of Shibata because Kaneda

teaches that conductive particles comprising metal with an insulating layer improves the insulating properties in the lateral direction of the metal particles.

Applicants respectfully disagree with this allegation. One of ordinary skill in the art would have not been motivated to combine the references as alleged by the Office Action. In essence, the Office argues that the skilled artisan would have been motivated to modify Shibata by replacing its conductive grains 32 with the conductive particles 2-6 of Kaneda et al. because the Kaneda conductive particles 2-6 would have improved the insulating properties in the lateral direction of the device of Shibata.

To begin with, the Office has not substantiated that the skilled artisan would understand that such an insulating property is needed. Kaneda discloses that the electrical conduction between a bonding pad 2-2 and a terminal 2-7 is ensured through the conductive particles 2-6 contained in the anisotropic conductive adhesive material. Kaneda also discloses that with regard to the conduction to adjacent terminals, the insulating resin (of the adhesive material) present between the particles provides no electrical conductivity and ensures anisotropic conductivity only in the direction of contact bonding. *See column 4, line 62 through column 5, line 4.* Such a conclusion would be supported by the name of the conductive adhesive material, which is an “anisotropic” conductive material. As the skilled artisan would understand, this term means that the conductivity is in a single direction (i.e., between the terminal and the bond pad and therefore through the conductive particles 2-6).

It is true that the Kaneda describes—as noted by the Office—that the insulation in the lateral direction could be improved by thin organic insulating films on the metal particles. But would the skilled artisan have wanted to increase the insulation when Kaneda also describes that is it not needed? Probably not, since such a modification would have increased the cost and

complexity of making the conductive 32 of Shibata because of the additional step of forming the thin organic insulating film of the metal particle.

Further, the Office's proposed modification would have made Shibata's device unsuitable for its intended use. Shibata describes at length that his device is manufactured by using ultrasonic vibration as opposed to merely heating so that a more reliable electrical connection is made and an alloy bonding results. *See columns 3-4*. The ultrasonic vibration used by Shibata ensures that the metal of the conductive grains 32 contacts the terminals. *See column 3, lines 19-26*.

But the Office has not shown that using the insulated metal particles 2-6 of Kaneda in the device of Shibata would have formed the interconnection desired by Shibata. In the process of Kaneda, the heating and pressure applied to the insulated metal particles 2-6 breaks the insulating layers on the particles at the interface with the terminal and bond pad to form the electrically interconnection. In other words, Kaneda teaches a heat conductive bonding process, the result of which would be destruction of the insulating layer between the metal particle and terminal and bond pad (where the electrical connection needs to be formed). *See column 6, lines 48-51*.

But Shibata purposefully avoids such a heating process. *See columns 1-2*. Instead, Shibata uses an ultrasonic vibration to connect the conductive grains to the terminals 11 and 21. In other words, Shibata discloses that ultrasonic vibration is used on the conductive particles to form the electrical contact between the terminals 11 and 21, but without the heating that would melt some of an insulating layer on the conductive particles. *See, e.g., column 3, lines 19-43 and column 8, lines 19-47*.

Thus, the Office has not shown that the ultrasonic vibration process of Shibata would have broken the insulating layer contained on the insulated metal particles 2-6. And if the

insulating layer on the conductive particle is not broken, than a conductive path will not be formed. Accordingly, the Office's proposed modification actually teaches away from the disclosure of Shibata because the Office has not shown that an electrical contact would have resulted. Accordingly, one of ordinary skill would not have looked to select the conductive particles of Kaneda with an insulating layer for use in the device of Shibata because the insulating layer would prevent or limit the electrical connection needed in the device of Shibata.

2. The Office also recognizes that Shibata fails to teach that the stud bump comprises Cu, as recited in some of the dependent claims. The Office argues, however, that it would have been obvious to replace the Au material in Shibata with a Cu material because these two materials are known to be equivalent materials used a bumps. In order to rely on equivalence as a rationale supporting an obviousness rejection, however, the equivalency must be recognized in the prior art. *See M.P.E.P. § 2144.06; In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958). Shibata describes, though, that the metals forming the terminals and the conductive grains are so properly selected as to form a eutectic alloy on contact portions thereof. *See column 4, lines 1-4*. Thus, the metals are carefully selected by Shibata so that a eutectic alloy is formed. But the Office has not shown that if the stud bump comprises Cu, as proposed, such a eutectic alloy would be formed. So the Office has not shown that Au and Cu would be an equivalent in the device of Shibata.

Thus, the Office failed to establish a *prima facie* case of obviousness based on the proposed combination of cited references. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

Rejection under 35 U.S.C. § 103

Claims 6, 13, 17, 35, 39, and 43 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shibata in view of Kaneda, further in view of Figures 1-3 of the present application. Applicants respectfully traverse this rejection.

Applicants respectfully traverse this rejection because the Offices has not argued—much less alleged—that the proper combination Shibata and Kaneda suggests each and every limitation in the claims, namely, a conductive particle with an insulating layer. And the Office has not pointed to any description in Figures 1-3 that would rectify such a deficiency. Thus, the Office failed to establish a *prima facie* case of obviousness and this rejection should be withdrawn.

CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests the Office to withdraw the pending grounds of rejection and allow all the pending claims.

If there is any fee due in connection with the filing of this Request, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

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